CLAIMS

- 1. An apparatus for control of echo return loss in a
- 2 communication system using a packet switched network, the
- 3 communication system comprising a telephone device having a
- 4 plurality of transducers and a computer for running a
- 5 communication process, the apparatus comprising:
- 6 a converter coupled to the telephone device, the converter
- 7 generating analog signals from digital signals and digital
- 8 signals from analog signals;
- g a bus interface coupled to the computer, the bus interface
- 10 coupling the apparatus to the communication system; and
- a controller coupled to the converter and the bus interface,
- 12 the controller controlling operation of the apparatus by
- 13 detecting and attenuating echo conditions.
 - 1 2. The apparatus of claim 1 wherein the bus interface is a
 - 2 Universal Serial Bus interface.
 - 1 3. The apparatus of claim 1 wherein the controller is a
 - 2 microprocessor that comprises means for detecting an input
 - 3 signal's relative amplitude and means for inserting attenuation
 - 4 in a transmit or receive signal in response to the amplitude.
 - 1 4. The apparatus of claim 1 wherein the converter
 - 2 comprises a codec.

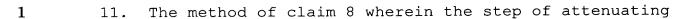
- 5. The apparatus of claim 1 wherein the telephone device
 comprises a telephone handset and the plurality of transducers
 comprise a microphone and a speaker.
- 1 6. The apparatus of claim 1 wherein the telephone device comprises a telephone headset and the plurality of transducers comprise a microphone and a speaker.
- 7. The apparatus of claim 1 and further including a side tone path coupled between an input and an output of the converter, the side tone path inserting a side tone in a signal from the output of the converter in response to an input signal.

1	8. A method for controlling echo return loss in a
2	computer-based communication device coupled to a packet switched
3	network, the method comprising the steps of:
4	detecting a receive linear signal from the communication
5	device;
6	detecting a transmit linear signal from the communication
7	device;
8	measuring a relative amplitude of the receive linear signal;
9	measuring a relative amplitude of the transmit linear
□ 10	signal;
₫ 11	if the relative amplitude of the receive linear signal is
12 13	greater than a switching threshold, attenuating the transmit
卓 页 13	linear signal; and
14 ±	if the relative amplitude of the transmit linear signal is
는 및 15	greater than the switching threshold, attenuating the receive
16 5 5	linear signal.
1	9. The method of claim 8 and further including the step of
2	if the relative amplitudes of both the receive linear signal and
3	the transmit linear signal are above the switching threshold,
4	attenuating the receive linear signal.

10. The method of claim 8 wherein the step of attenuating $2\,$ the transmit linear signal includes full attenuation of the

the step of

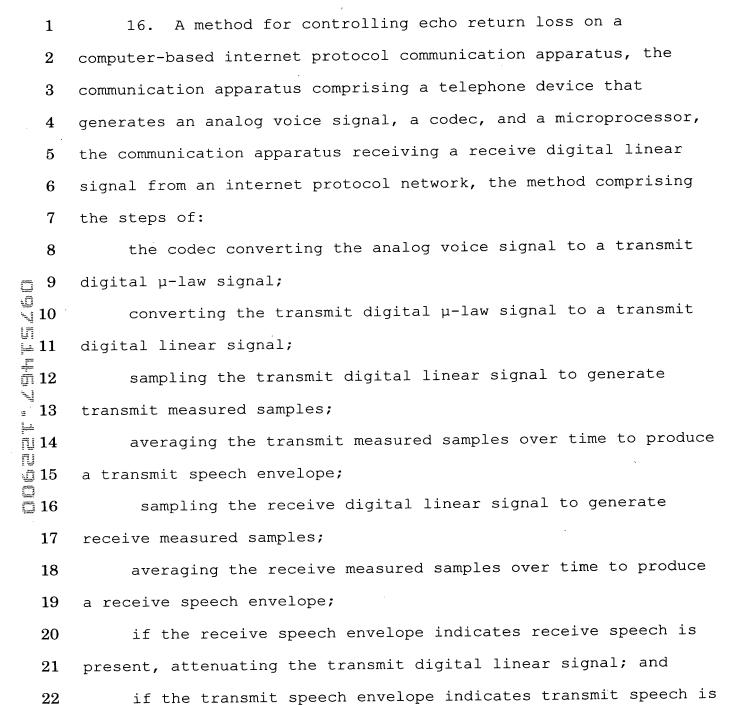
3 transmit linear signal.



- 2 the receive linear signal includes full attenuation of the
- 3 receive linear signal.
- 1 12. The method of claim 9 wherein the step of attenuating
- 2 the receive linear signal includes partial attenuation of the
- 3 receive linear signal.
- 1 13. The method of claim 8 wherein the step of measuring a
- 2 relative amplitude of the receive linear signal includes
- 3 detecting an envelope of the receive linear signal.
- 1 14. The method of claim 8 wherein the step of measuring a
- 2 relative amplitude of the transmit linear signal includes
- 3 detecting an envelope of the transmit linear signal.

15. A communication system that communicates over a packet

2	switched network, the communication system comprising:
3	a telephone device comprising a plurality of transducers;
4	an audio interface coupled to the telephone device, the
5	audio interface comprising:
6	a codec coupled to the telephone device, the codec
7	having means for converting transmit analog signals from the
8	telephone device to transmit digital signals and the codec
9	also having means for converting receive digital signals
10	from the packet switched network to receive analog signals
11	for use by the telephone device; and
12	a controller comprising a bus interface and a
13	microprocessor for controlling the audio interface, the
14	microprocessor having means for detecting an input signal's
15	relative amplitude and controlling attenuation of the
16	transmit and receive digital signals in response to the
17	input signal's relative amplitude; and
18	a computer coupled to the bus interface and the packet
19	switched network, the computer comprising a controller that runs
20	a communication process.



present, attenuating the receive digital linear signal.

- 1 17. The method of claim 16 and further including the step
- $2\,$ of if both the receive and transmit speech envelopes indicate
- $3\,$ speech in their respective signals, partially attenuating the
- 4 receive digital linear signal.
- 1 18. The method of claim 16 and further including the steps
- 2 of:
- 3 converting the receive digital linear signal to a receive
- 4 digital μ -law signal; and
- 5 converting the receive digital μ -law signal to an analog
- $6\,$ signal for use by the telephone device.

An apparatus for control of echo return loss in a 1 19. 2 computer-based internet protocol communication system, the 3 apparatus comprising: means for converting a transmit digital μ -law signal to a 4 transmit linear signal; 5 means for sampling the transmit linear signal to generate 6 7 transmit measured samples; 8 means for averaging the transmit measured samples over time 5 10 5 11 5 11 5 12 to generate a transmit speech envelope; 9 means for sampling a receive linear signal to generate receive measured samples; means for averaging the receive measured samples over time 13 to generate a receive speech envelope; ⊭ ∏ 14 means for comparing relative amplitudes of both the transmit 15 15 16 speech envelope and the receive speech envelope; means for inserting receive attenuation in the receive 17 linear signal, coupled to the means for comparing, in response to 18 detection of speech in the transmit speech envelope; and 19 means for inserting transmit attenuation in the transmit

1 20. The apparatus of claim 19 and further including means

linear signal, coupled to the means for comparing, in response to

2 for converting the receive linear signal to a receive µ-law

detection of speech in the receive speech envelope.

3 digital signal.

3

20

21





- 1 The apparatus of claim 20 and further including means
- 2 for converting the receive μ -law digital signal to an analog
- signal for use by the communication system. 3